

What is claimed is:

1. A method for clocking a blade ring containing a plurality of airfoils relative to another row of airfoils comprising the steps of:

(a) providing an outer casing having an elongated hollow body, an outer peripheral surface and an inner peripheral surface, the outer casing having a first set of openings and a second set of openings, each of the openings extending between the outer peripheral surface and the inner peripheral surface of the outer casing;

(b) providing a blade ring disposed inside of the outer casing, the blade ring having an inner peripheral surface and an outer peripheral surface, the blade ring including a plurality of airfoils attached to the inner peripheral surface and a plurality of notches in the outer peripheral surface;

(c) providing a plurality of pins inserted through the first set of openings in the outer casing and engaging at least some of the notches in the outer peripheral surface of the blade ring such that the blade ring is substantially fixedly held within the outer casing;

(d) providing a plurality of roller pins, each of the roller pins having a roller at one end;

(e) inserting the plurality of roller pins through the second set of openings such that the roller of each of the roller pins engages the outer peripheral surface of the blade ring; and

(f) disengaging the pins from the notches in the outer peripheral surface of the blade ring,

whereby the blade ring is held in position and supported by the plurality of roller pins.

2. The method of claim 1 wherein the blade ring includes at least one pair of attachments.

3. The method of claim 2 further comprising the steps of:

(g) attaching a first actuator to one attachment of a first pair of attachments; and

4 (h) attaching a second actuator to the other attachment of the first pair of
5 attachments.

1 4. The method of claim 3 wherein the pair of attachments include one of eyelets,
2 lugs, hooks, loops, ears, posts, and hitches.

1 5. The method of claim 3 wherein the first and second actuators are one of
2 cables, chains, straps, ropes, gears, hydraulic cylinders, cranes, and winches.

1 6. The method of claim 3 further comprising the step of:
2 (i) rotating the blade ring in a first direction by using the first and second
3 actuators to impart substantially tangential forces on the blade ring.

1 7. The method of claim 6 wherein the first direction is one of clockwise or
2 counterclockwise.

1 8. The method of claim 6 further including the step of:
2 (j) rotating the blade ring in one of the first direction or a second direction
3 by using the first and second actuators to impart substantially tangential forces on
4 the blade ring.

1 9. The method of claim 8 further including the step of:
2 (k) repeating step (j) until the blade ring is rotated into the desired position.

1 10. The method of claim 9 further including the steps of:
2 (l) reinstalling the plurality of pins through the first set of openings in the
3 outer casing such that the pins engage at least some of the notches in the outer
4 peripheral surface of the blade ring such that the blade ring is substantially fixedly
5 held within the outer casing; and

6 (m) removing the plurality of roller pins.

1 11. The method of claim 6 further comprising the steps of:

2 (n) attaching a third actuator to an attachment of a second pair of
3 attachments; and
4 (o) attaching a fourth actuator to the other attachment of the second pair of
5 attachments.

1 12. The method of claim 11 wherein the third and fourth actuators are one of
2 cables, chains, straps, ropes, gears, hydraulic cylinders, cranes, and winches.

1 13. The method of claim 11 further including the step of:
2 (p) rotating the blade ring in a second direction by using the third and
3 fourth actuators to impart substantially tangential forces on the blade ring.

1 14. The method of claim 13 further including the step of:
2 (q) repeating at least one of steps (j) and (p) until the blade ring is rotated
3 into the desired position.

1 15. A blade ring for a turbine engine comprising:
2 a hollow substantially cylindrical body having an inner peripheral surface and
3 an outer peripheral surface;
4 a plurality of airfoils attached to the inner peripheral surface of the body;
5 a plurality of notches in the outer peripheral surface of the body; and
6 at least one pair of attachments on the outer peripheral surface.

1 16. The blade ring of claim 15 wherein the at least one pair of attachments are
2 one of eyelets, lugs, hooks, loops, ears, posts, and hitches.

1 17. The blade ring of claim 15 wherein one attachment of the at least one pair of
2 attachments is disposed substantially peripherally opposite to the other attachment
3 of the at least one pair of attachments.

1 18. The blade ring of claim 15 wherein the plurality of notches are disposed
2 substantially equidistantly about the outer periphery of the blade ring.

1 19. The blade ring of claim 15 wherein the plurality of notches includes at least
2 four groups of notches, wherein each group includes three notches, the groups of
3 notches being disposed substantially equidistantly about the outer periphery of the
4 blade ring.

1 20. A method for clocking a blade ring containing a plurality of airfoils relative to
2 another row of airfoils comprising the steps of:

3 (a) providing an outer casing having an elongated hollow body, an outer
4 peripheral surface and an inner peripheral surface, the outer casing having a first set
5 of openings and a second set of openings, each of the openings extending between
6 the outer peripheral surface and the inner peripheral surface of the outer casing;

7 (b) providing a blade ring disposed inside of the outer casing, the blade
8 ring having an inner peripheral surface and an outer peripheral surface, the blade
9 ring including a plurality of airfoils attached to the inner peripheral surface and a
10 plurality of notches in the outer peripheral surface, wherein the blade ring includes at
11 least one integral pair of attachments and the outer casing includes at least one
12 removable access panel for permitting access to the at least one pair of attachments;

13 (c) providing a plurality of pins, the pins being inserted through the first set
14 of openings in the outer casing and engaging at least some of the notches in the
15 outer peripheral surface of the blade ring such that the blade ring is substantially
16 fixedly held within the outer casing;

17 (d) providing at least three roller pins, each of the roller pins having a roller
18 at one end;

19 (e) inserting the at least three roller pins through the second set of
20 openings such that the roller of each of the roller pins engages the outer peripheral
21 surface of the blade ring;

22 (f) disengaging the pins from the notches in the outer peripheral surface of
23 the blade ring, wherein the blade ring is substantially held in position and
24 substantially supported by the at least three roller pins.

25 (g) removing the at least one access panel;

26 (h) attaching a first actuator to an attachment of a first pair of attachments,
27 wherein the first actuator is one of cables or chains;

28 (i) attaching a second actuator to the other attachment of the first pair of
29 attachments, wherein the second actuator is one of cables or chains;
30 (j) rotating the blade ring by substantially simultaneously pulling the first
31 and second actuators so as to impart substantially tangential forces on the blade
32 ring,
33 whereby rotation of the blade ring is facilitated by engagement with the roller
34 pins.